

CURRENTLY PENDING CLAIMS

Please amend the claims as follows:

1.-8. (Cancelled)

9. (Currently Amended) A method for chemical mechanical polishing of tungsten comprising:

providing a semiconductor substrate comprising on one face tungsten and a dielectric material;

providing a chemical mechanical polishing composition comprising between about 0.5% and about 10% periodic acid, between about 0.1% and about 10% of a secondary oxidizer, a pH adjusting compound to adjust the pH of the composition, wherein the pH of the composition is ~~between about 4 to about 12~~ from about 6 to about 9;

movably contacting the substrate face with a pad exerting between about 0.1 and about 9 psi pressure on the substrate and with the composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

10. (Previously Amended) A method for chemical mechanical polishing of tungsten comprising:

providing a semiconductor substrate comprising on one face tungsten and a dielectric material;

providing a chemical mechanical polishing composition comprising between about 0.5% and about 10% periodic acid, between about 0.1% and about 10% of malonic acid, and a pH adjusting compound to adjust the pH of the composition, wherein the pH of the composition is between about 4 to about 12; and

movably contacting the substrate face with a pad exerting between about 0.1 and about 9 psi pressure on the substrate and with the composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

11. (Original) The process of claim 9 wherein the chemical mechanical polishing composition comprises at least one of potassium iodate, potassium periodate, or lithium periodate.

12. (Original) The process of claim 9 wherein the chemical mechanical composition comprises ammonium persulfate, peracetic acid, oxalic acid, NH_4HF_2 , or a mixture thereof.

13. (Previously Amended) The process of claim 9 wherein the secondary oxidizer comprises a perborate.

14. (Original) The process of claim 9 wherein the chemical mechanical polishing composition additionally comprises an organic acid selected from the group consisting of gluconic, malonic acid, lactic acid, succinic acid, tartaric acid, citric acid, oxalic acid, or salts thereof.

15. (Currently Amended) The process of claim 9 further comprising a second polishing operation comprising the steps of:

providing a second chemical mechanical polishing composition comprising an oxidizer, a pH adjusting compound to adjust the pH of the second composition, wherein the pH of the composition is between about 3 to about 12; and

movably contacting the substrate face with a pad exerting between about 0.1 and about 9 psi pressure on the substrate and with the second composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

16. (Currently Amended) The process of claim 15 wherein the second chemical mechanical polishing composition comprises between about 0.5% and about 10% periodic acid and a pH adjusting compound to adjust the pH of the composition, wherein the pH of the second composition is between about 3 to about 12.

17.-47. (Cancelled)

48. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises potassium peroxymonosulfate.

49. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises potassium iodate.

50. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises potassium periodate.

51. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises lithium periodate.

52. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises ammonium persulfate.

53. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises peracetic acid.

54. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises NH_4HF_2 .

55. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises a peroxide hydrate.

56. (Previously Added) The method of claim 9 wherein the secondary oxidizer comprises a urea hydrogen peroxide complex.

57. (Previously Added) A method for chemical mechanical polishing of tungsten comprising:

providing a semiconductor substrate comprising on one face tungsten and a dielectric material;

providing a chemical mechanical polishing composition comprising between about 0.5% and about 10% periodic acid, between about 0.1% and about 10 % of imidazole or malonamide, and a pH adjusting compound to adjust the pH of the composition, wherein the pH of the composition is between about 4 to about 12; and

movably contacting the substrate face with a pad exerting between about 0.1 and about 9 psi pressure on the substrate and with the composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

58. (Previously Added) A method for chemical mechanical polishing of tungsten comprising:

providing a semiconductor substrate comprising on one face tungsten and a dielectric material;

providing a chemical mechanical polishing composition comprising between about 0.5% and about 10% periodic acid, between about 0.1% and about 10 % of oxalic acid, and a pH adjusting compound to adjust the pH of the composition, wherein the pH of the composition is between about 4 to about 12; and

movably contacting the substrate face with a pad exerting between about 0.1 and about 9 psi pressure on the substrate and with the composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

59. (Previously Added) The process of claim 10 wherein the chemical mechanical polishing composition additionally comprises an organic acid selected from the group consisting of gluconic acid, lactic acid, succinic acid, tartaric acid, citric acid, oxalic acid, or salts thereof.

60. (Previously Added) The process of claim 10 wherein the chemical mechanical polishing composition additionally comprises an abrasive.

61. (Previously Added) The process of claim 10 wherein the chemical mechanical polishing composition additionally comprises imidazole or malonamide.

62. (Previously Added) The process of claim 10 further comprising a second polishing operation comprising the steps of:

providing a second chemical mechanical polishing composition comprising an oxidizer, a pH adjusting compound to adjust the pH of the composition, and optionally an abrasive, wherein the pH of the composition is between about 3 to about 12;

movably contacting the substrate face with a pad exerting between about 0.1 and about 9 psi pressure on the substrate and with the second composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

63. (Currently Amended) The process of claim 62 wherein the second chemical mechanical polishing composition comprises between about 0.5% and about 10% periodic acid and a pH adjusting compound to adjust the pH of the composition, wherein the pH of the second composition is between about 3 to about 12.

Please also add new claims 64-66 as follows:

64. (New) The method of claim 9, wherein the pH of the composition is from 7 to 9.

65. (New) The method of claim 10, wherein the pH of the composition is from 6 to 9.

66. (New) The method of claim 10, wherein the pH of the composition is from 7 to 9.